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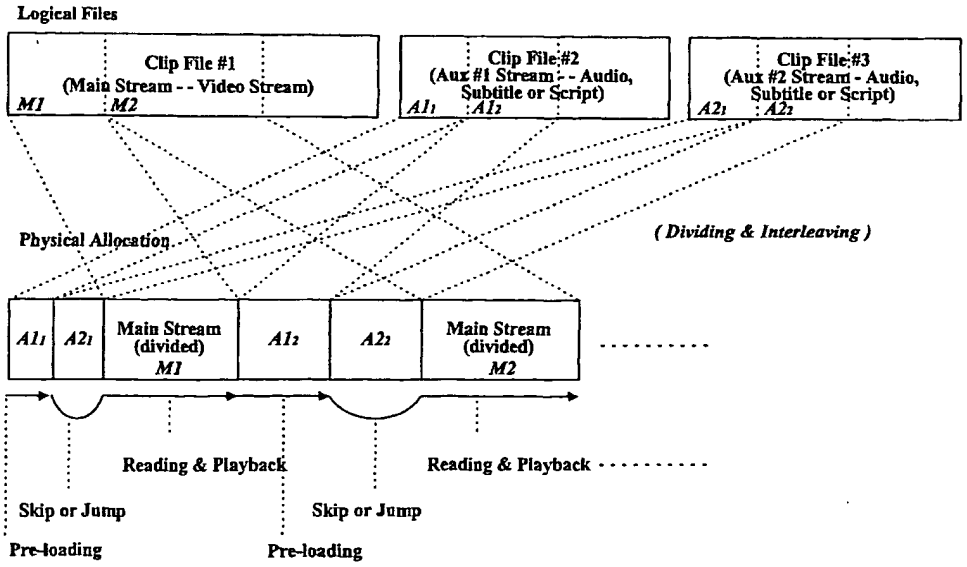
(54) Title: METHOD AND APPARATUS FOR RECORDING A MULTI-COMPONENT STREAM AND A HIGH-DENSITY RECORDING MEDIUM HAVING A MULTI-COMPONENT STREAM RECORDED THERON AND REPRODUCING METHOD AND APPARATUS OF SAID RECORDING MEDIUM



(57) Abstract: The present invention records a main stream containing video contents and an auxiliary stream related therewith as logically-separated clip files on a recording medium. The logically-separated clip files, however, are interleaved on a physical recording area. Because the interleaved units of the auxiliary stream can be individually identified by a file system of the recording medium, the auxiliary stream recorded on the recording medium can be replaced with another one during reproduction or presentation.

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DESCRIPTION

METHOD AND APPARATUS FOR RECORDING A MULTI-COMPONENT STREAM AND A HIGH-DENSITY RECORDING MEDIUM HAVING A MULTI-COMPONENT STREAM RECORDED THERON AND REPRODUCING METHOD AND APPARATUS OF SAID RECORDING MEDIUM

1. TECHNICAL FIELD

The present invention relates to method and apparatus for recording a multi-component stream including a main stream and an auxiliary stream, which includes additional audio or information about contents carried by the main stream, on a high-density recording medium, and further to a high-density recording medium on which a main stream and an auxiliary stream related therewith have been recorded by said method.

2. BACKGROUND ART

Recently, in accordance with rapid advancement of standardization of a novel high-density rewritable optical disc such as 'Blu-ray Disc Rewritable' (called 'BD-RE') capable of recording high quality video and audio data for many hours, it is expected that related products are soon developed and released to consumer market.

The standard of BD-RE specifies that, when a main stream containing main video and its auxiliary stream containing subtitles or additional audio data of the main video is recorded on a BD-RE, a received main stream and various auxiliary streams (Aux #1 - Aux #n Stream) are multiplexed by a multiplexer (MUX) in the units of an MPEG-2 transport stream packet and thus recorded and managed as a single clip file, as shown in FIG. 1. A main stream combined with or to be presented with an auxiliary stream is called a

'multi-component stream'

However, the aforementioned BD-RE standard about simultaneous recording of main and auxiliary stream that a main stream including video contents and its auxiliary stream are multiplexed in the units of a transport stream packet and recorded as a single clip file has problems that another auxiliary stream associated with a main stream cannot be added and or an original auxiliary stream combined into a main stream can not be replaced by another.

Recently, development and standardization of a high-density read-only optical disc called 'Blu-ray Disc ROM' (abbreviated 'BD-ROM') are also in progress. However, if recording of a main stream and its auxiliary stream for a BD-ROM is conducted the same as the aforementioned standard of BD-RE, an original auxiliary stream combined with a main stream can not be replaced with another during presentation although a user wants to. Therefore, an efficient recording method capable of adding or substituting an auxiliary stream associated with a main stream recorded on a BD-ROM needs to be provided immediately.

3. DISCLOSURE OF INVENTION

It is an object of the present invention is to provide method and apparatus for recording a multi-component data stream on a high-density recording medium in such a manner that an auxiliary stream associated with a main stream can be added or substituted later.

It is another object of the present invention is to provide a high-density recording medium on which an auxiliary stream associated with a main stream can be added or substituted while being reproduced.

It is another object of the present invention is to provide method and apparatus for reproducing a data stream recorded on a high-density recording medium on which a multi-component data

stream is recorded in such a manner that an auxiliary stream can be added or substituted.

A method of recording a multi-component data stream on a recording medium in accordance with the present invention is characterized in that it records a first stream and a second stream related the first as logically-separated files while interleaving the first and the second stream on a physical recording area of the recording medium.

A method of recording a multi-component data stream on a recording medium in accordance with the present invention is further characterized in that it interleaves a first and a second stream in such a manner that size of each interleaved unit of the first and the second stream is equal to or multiples of an allocation unit defined by FAT (File Allocation Table) adopted by the recording medium.

A method of reproducing a multi-component data stream recorded on a recording medium in accordance with the present invention is characterized in that it comprises the steps of: reproducing the multi-component data stream, where a first stream and a second stream interleaved on a physical recording area of the recording medium, while reading interleaved units of only the first stream and skipping the interleaved units of the second stream, wherein the first and the second stream are recorded as logically-separated files; and making presentation of the read units of the first stream in conjunction with a third stream that is received from a device other than the recording medium.

Another method of reproducing a multi-component data stream recorded on a recording medium in accordance with the present invention is characterized in that it comprises the steps of: reproducing the multi-component data stream where a first stream and a second stream interleaved on a physical recording area of the recording medium, wherein the first and the second stream are recorded as logically-separated files; and at a jump request, moving

a reproduction point on a current interleaving unit of the first stream to other target interleaving unit after reproduction of the current interleaving unit to the last.

A high-density recording medium in accordance with the present invention is characterized in that it comprises: a first stream and a second stream associated with the first stream being interleaved alternately; and a first file organized by interleaved units of the first stream and a second file organized by interleaved units of the second stream.

The high-density recording medium in accordance with the present invention is further characterized in that it further comprises a plurality of entry points, each being an information unit to indicate an arbitrary interval of the first stream of the two.

The high-density recording medium in accordance with the present invention is still further characterized in that all of the interleaved units of the first stream recorded on the recording medium are respectively covered by same number of the entry points.

4. BRIEF DESCRIPTION OF DRAWINGS

The above features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a diagram illustrating a recording example wherein a main stream and multiple auxiliary streams are recorded and managed as a single clip file;

FIG. 2 illustrates an exemplary embodiment of a recording medium file or data structure according to the present invention;

FIG. 3 illustrates an example of a recording medium having the data structure of FIG. 2 stored thereon;

FIG. 4 is a diagram illustrating a recording embodiment wherein a main stream and auxiliary streams are interleaved and

managed as logically-separated clip files in accordance with the present invention;

FIG. 5 is a diagram illustrating another embodiment wherein a main stream and auxiliary streams are interleaved in accordance with the present invention;

FIGS. 6 and 7 are diagrams illustrating another embodiments wherein a main stream and auxiliary streams are interleaved in accordance with the present invention; and

FIG. 8 illustrates a schematic diagram of an embodiment of an optical disk recording and reproduction apparatus of the present invention; and

FIG. 9 shows an illustrative detailed structure of a decoder in FIG. 8.

5. MODES FOR CARRYING OUT THE INVENTION

In order that the invention may be fully understood, preferred embodiments thereof will now be described with reference to the accompanying drawings.

A high-density optical disk, for example, a Blu-Ray ROM (BD-ROM), BD-RE, etc. in accordance with the invention may have a file or data structure for managing reproduction of video and audio data as shown in FIG. 2. Some aspects of the data structure according to the present invention shown in FIG. 2 are the same as the well-known BD-RE standard, as such these aspects will not be described in great detail.

As shown in FIG. 2, the root directory contains at least one BD directory. The BD directory includes general files (not shown), a PLAYLIST directory in which playlist files (e.g., *.mpls) are stored, a CLIPINF directory in which clip information files (*.clpi) are stored, and a STREAM directory in which MPEG2-formatted A/V stream clip files (*.m2ts), corresponding to the clip information files, are stored.

The STREAM directory includes a main stream, e.g.,

MPEG2-formatted A/V stream files and auxiliary stream files of subtitle or script data that are called clips or clip files. The A/V and auxiliary stream include source packets of video, audio, subtitle, and/or script data.

For example, a source packet of video data includes a header and a transport packet. A source packet includes a source packet number, which is generally a sequentially assigned number that serves as an address for accessing the source packet. Transport packets include a packet identifier (PID). The PID identifies the sequence of transport packets to which a transport packet belongs. Each transport packet in the sequence will have the same PID.

The CLIPINF directory includes a clip information file associated with each main (A/V) stream or auxiliary stream file. The clip information file indicates, among other things, the type of A/V stream or auxiliary stream associated therewith, sequence information, program information and timing information.

The PLAYLIST directory includes one or more playlist files. The concept of a playlist has been introduced to promote ease of editing/assembling clips for playback. A playlist file is a collection of playing intervals in the clips. Each playing interval is referred to as a playitem. The playlist file, among other things, identifies each playitem forming the playlist, and each playitem, among other things, is a pair of IN-point and OUT-point that point to positions on a time axis of the clip (e.g., presentation time stamps on an ATC or STC basis).

Expressed another way, the playlist file identifies playitems, each playitem points to a clip or portion thereof and identifies the clip information file associated with the clip. The clip information file is used, among other things, to map the playitems to the clip of source packets.

The general files (not shown) provide general information for managing the reproduction of the A/V main streams and their auxiliary streams recorded on the optical disk.

In addition to illustrating the data structure of the recording medium according to an embodiment of the present invention, FIG. 2 represents the areas of the recording medium. For example, the general information files are recorded in one or more general information areas, the playlist directory is recorded in one or more playlist directory areas, each playlist in a playlist directory is recorded in one or more playlist areas of the recording medium, etc.

FIG. 3 illustrates an example of a recording medium having the data structure of FIG. 2 stored thereon. As shown, the recording medium includes a file system information area where FAT (File Allocation Table) is recorded, a data base area and an A/V and auxiliary stream area.

The data base area includes a general information file and playlist information area and a clip information area. The general information file and playlist information area have the general information files recorded in a general information file area thereof, and the PLAYLIST directory and playlist files recorded in a playlist information area thereof. The clip information area has the CLIPINF directory and associated clip information files recorded therein. The A/V & auxiliary stream area has the A/V main streams and their auxiliary streams for the various titles recorded therein.

Video and audio data are typically organized as individual titles; for example, different movies represented by the video and audio data are organized as different titles. Furthermore, a title may be organized into individual chapters in much the same way a book is often organized into chapters.

FIG. 4 illustrates an embodiment wherein a main stream and auxiliary streams namely, a multi-component stream pertaining to a single title is recorded in accordance with the present invention.

In the recording example, a main stream such as a video stream is recorded as the first clip file (Clip File #1); the first

auxiliary stream such as audio, a subtitle, or a script describing video scenes is recorded as the second clip file (Clip File #2); and the second auxiliary stream is recorded as the third clip file (Clip File #3). The clip files are logically separated each other.

However, the three clip files (Clip File #1, #2, #3) are interleaved in a physical recording area. That is, every file is divided into a plurality of data blocks that are same or different in size, and the divided data blocks of every clip file are mixed sequentially. In illustrative FIG. 4, the leading data blocks (M1,A11,A21) of the three files are allocated in the physical recording area in order of the second, the third and the first clip file.

The size of each divided data block of a main stream and an auxiliary stream is equal to or multiples of an allocation unit defined by FAT of the recording medium.

When dividing and recording sequentially as above, the divided data block of an auxiliary stream is placed ahead of a divided main data block associated with the divided auxiliary data block. In the illustrative recording example of FIG. 4, the divided leading auxiliary data blocks (A11, A21) preceding the divided leading main data block (M1) are associated with the main data block (M1).

In case of the recording example of FIG. 4, either of divided auxiliary data blocks, for example, the leading data block (A11) of the first auxiliary stream is read out and preloaded into a temporary storing means of a disk player before the associated main data block (M1) is read out; thereafter, the main data block (M1) is read and presented together with the preloaded auxiliary data block (A11) of the first auxiliary stream. In the event that only the first auxiliary stream of the second clip file (Clip File #2) is presented, the other second auxiliary stream is then skipped or jumped over.

On a main stream, a divided point is at which an entry point (EP) points as shown in FIG. 5.

In case that a play request from a recording position pointed by a particular EP of the main stream is made through, e.g., trick play based on time search, a disk player first searches the interleaved stream for either, e.g., the first of the two auxiliary data blocks ($A1_k$,$A2_k$) preceding to a main data block (Mk) including the recording position and preloads the found data block ($A1_k$) into an internal memory.

The disk player then jumps again to the recording position and reads out therefrom and presents the main stream in conjunction with a related part of the preloaded auxiliary data block $A1_k$.

A main stream can be divided in such a manner that each divided data block (also called 'IU' (Interleaved Unit) hereinafter) is covered by a fixed number N (≥ 1) of EPs, as shown in FIG. 6. Because each EP may have different time length, namely stream coverage, every IU is not same in recorded size.

Length information of each IU or the fixed number N of related EPs with a single IU is recorded in any of a clip information file for play control of the corresponding main stream clip file, or a playlist file or a playitem referring to that clip file.

The length of every IU or the fixed number N of EPs is determined so that necessary buffer size for a jump to another IU should not increase excessively, while at the same time, buffer underflow should not occur. In case that the determined length of every IU is too short or the fixed number N is too small, buffer underflow may arise during a big jump; moreover, the number of pieces of length information of all IUs to allocate and manage becomes relatively large.

On the other hand, in case that the determined length of IU is excessively long or the fixed number N is too large, buffer size for preloading an auxiliary data block increases greatly. For instance, if time length of an IU of a main stream of two-hour long is 30 minutes and its related auxiliary data block is continuous audio data at 384 kbps, then buffer size to preload the auxiliary

data block at a time reaches about 86 Mbytes that is relatively large to prepare by memories.

Consequently, as mentioned above, the length of each IU or the fixed number N of EPs corresponding to a single IU is determined in consideration of the chance of buffer underflow, buffer size, and amount of length information about respective IUs.

Unlike the embodiment of FIG. 6, the number of EPs corresponding to a single IU can vary as illustrated in FIG. 7. In the exemplary embodiment of FIG. 7, N EPs cover the first IU (M1) and K EPs do the second IU (M2). Furthermore, each IU can be associated with a chapter of clip file.

In the embodiment of FIG. 7, information indicative of the end of IU, e.g., an IU end flag (IU_End_Flag) included in the last EP associated with each IU is set to 'one', whereas IU end flags included in the remaining EPs are set to 'zero'.

FIG. 8 illustrates a schematic diagram of an embodiment of an optical disk recording and reproducing apparatus according to the present invention. As shown, an AV encoder 9 receives and encodes data (e.g., multi-component data, A/V data, only audio data, subtitle, script language, and/or still image data).

The AV encoder 9 outputs the encoded data along with coding information and stream attribute information. A multiplexer 8 multiplexes the encoded data based on the coding information and stream attribute information to create, for example, an MPEG-2 transport stream. A source packetizer 7 packetizes the transport packets from the multiplexer 8 into source packets in accordance with the audio/video format of the optical disk.

As shown in FIG. 8, the operations of the AV encoder 9, the multiplexer 8 and the source packetizer 7 are controlled by a controller 10. The controller 10 receives user input on the recording operation, and provides control information to AV encoder 9, multiplexer 8 and the source packetizer 7. For example, the controller 10 instructs the AV encoder 9 on the type of encoding

to perform, instructs the multiplexer 8 on the transport stream to create, and instructs the source packetizer 7 on the source packet format. The controller 10 further controls a drive 3 to record the output from the source packetizer 7 on the optical disk.

The controller 10 also creates the navigation and management information for managing reproduction of the data being recorded on the optical disk. For example, based on information received via the user interface (e.g., instruction set saved on disk, provided over an intranet or internet by a computer system, etc.) the controller 10 controls the drive 3 to record one or more of the data structures of FIGS. 2-7 on the optical disk.

During reproduction, the controller 10 controls the drive 3 to reproduce this data structure. Based on the information contained therein, as well as user input received over the user interface (e.g., control buttons on the recording and reproducing apparatus or a remote associated with the apparatus), the controller 10 controls the drive 3 to reproduce the data from the optical disk.

For example, as discussed above with respect to the embodiments of the present invention, an auxiliary stream in a separate clip file may be reproduced in conjunction with a main stream in another clip file based on the navigation information. Furthermore, two or more auxiliary streams of respective files may be reproduced sequentially along with their main stream.

The reproduced source packets of a main and an auxiliary stream are received by a source depacketizer 4 and converted into respective data streams (e.g., MPEG-2 transport packet streams). A demultiplexer 5 demultiplexes the respective data streams into encoded data of main video and auxiliary contents such as audio, subtitle and script language. An AV decoder 6 decodes the encoded main and auxiliary data to produce the original data that was fed to the AV encoder 9.

During reproduction, the controller 10 controls the operation of the source depacketizer 4, demultiplexer 5 and AV decoder 6.

The controller 10 receives user input on the reproducing operation, and provides control information to AV decoder 6, demultiplexer 5 and the source depacketizer 4. For example, the controller 10 instructs the AV decoder 9 on the type of decoding to perform, instructs the demultiplexer 5 on the transport stream to demultiplex, and instructs the source depacketizer 4 on the source packet format.

As shown in FIG. 9, the A/V decoder 6 includes as many buffers 61_N as necessary to decode main and auxiliary stream data adequately, and besides video and audio decoding units $62_1, 62_2$, it may include an adequate script interpreting unit 62_3 for interpreting an auxiliary stream of script language and/or a browsing unit 62_4 for processing an auxiliary stream of HTML or XML documents.

In structure of the A/V decoder 6, the demultiplexer 5 demultiplexes the inputted respective data streams into encoded data and then separates the encoded data into the pre-assigned respective buffers 61_N.

While FIG. 8 has been described as a recording and reproducing apparatus, it will be understood that only a recording or only a reproducing apparatus may be provided using those portions of FIG. 8 providing the recording or reproducing function.

In the apparatus of FIG. 8, when a jump to another IU is requested during reproduction, the controller 10 continues to reproduce a current data block, namely IU until the last interval within the current IU whose EP has value of '1' in its IU_End_Flag is completely reproduced. After completion of reproduction of the last interval, the controller 10 conducts jump operation to a target IU. Such a jumping scheme always enables successful playback completion of a preloaded data block of auxiliary stream and a current data block of main stream regardless of jumping.

An auxiliary stream to be played in conjunction with a main stream can be obtained from outside or through a communication network such as internet. In this case, the optical disc apparatus of FIG. 8 downloads the auxiliary stream related with a main stream

recorded on an optical disk into an internal memory (not shown). Afterwards, whenever a data block of the main stream is encountered, the auxiliary stream that has been downloaded or is being downloaded in the internal memory is preloaded as much as necessary for simultaneous presentation of the encountered data block. The preloaded auxiliary data block is then presented in conjunction with the corresponding main stream data block to be reproduced.

A transmitting unit of the auxiliary stream, that is downloaded at a time from a network, is pre-specified as each auxiliary data block associated with each IU of a main stream recorded on an optical disk or is determined by mutual communications between the optical disc apparatus and a server on the network.

Because an auxiliary stream is organized as a clip file separated with a main stream clip file in accordance with the present invention, data blocks of the auxiliary stream can be identified individually on the interleaved main and auxiliary stream via FAT recorded on the file system information area.

Accordingly, an original auxiliary stream recorded on a recording medium can be skipped from the mixed stream by only not selecting corresponding auxiliary stream clip file, so that it can be replaced with another auxiliary stream, e.g., a stream downloaded from a network and the downloaded auxiliary stream can be presented in conjunction with a main stream recorded on the recording medium. Consequently, an original auxiliary stream on a recording medium can be replaced and a new auxiliary stream can be added.

While the invention has been disclosed with respect to a limited number of embodiments, those skilled in the art, having the benefit of this disclosure, will appreciate numerous modifications and variations there from. For example, while described with respect to a Blu-ray ROM optical disk in several instances, the present invention is not limited to this standard of optical disk or to optical disks. It is intended that all such

modifications and variations fall within the spirit and scope of the invention.

CLAIMS

1. A method of recording a multi-component data stream on a recording medium, comprising:

recording a first stream and a second stream as logically-separated files while interleaving the first and the second stream on a physical recording area of the recording medium.

2. The method of claim 1, wherein the first stream is a video stream while the second stream is a data stream associated with video of the first stream.

3. The method of claim 1, wherein an interleaved unit of the first stream is a stream section covered by N ($\geq$1) entry points, each entry point being an information unit to indicate an arbitrary interval of a data stream.

4. The method of claim 1, wherein an interleaved unit of the first stream is a stream section covered by a plurality of entry points, each entry point being an information unit to indicate an arbitrary interval of a data stream.

5. The method of claim 4, wherein every interleaved unit of the first stream is not covered by same number of entry points.

6. The method of claim 4, wherein a last entry point among the plurality of entry points covering each interleaved unit of the first stream has information indicative of a last interval pertaining to the interleaved unit.

7. The method of claim 1, wherein size of each interleaved unit of the first and the second stream is equal to or multiples of an allocation unit defined by FAT (File Allocation Table) of the recording medium.

8. The method of claim 1, wherein the second stream has data of audio, subtitle, script language, or mark-up language document.

9. The method of claim 1, wherein, on the interleaved stream of the first and the second stream, an interleaved unit of the second

stream is adjacent to an interleaved unit of the first stream that is associated with the interleaved unit of the second stream.

10. The method of claim 9, wherein the interleaved unit of the second stream is located just before the associated interleaved unit of the first stream.

11. The method of claim 9, wherein the size of an interleaved unit of the first stream is determined so that a buffer underflow does not occur during a jump to another position on the first stream.

12. The method of claim 1, wherein size information about an interleaved unit of the first and the second stream is recorded in any of a related clip information file for play control thereof, a playlist file, or a playitem included in the playlist file.

13. A method of recording a multi-component data stream on a recording medium, comprising:

recording a main stream and at least one auxiliary stream associated therewith as logically-separated files while interleaving the streams alternately on a physical recording area of the recording medium.

14. A method of reproducing a multi-component data stream recorded on a recording medium, comprising:

reproducing the multi-component data stream, where a first stream and a second stream interleaved on a physical recording area of the recording medium, while reading interleaved units of only the first stream and skipping the interleaved units of the second stream, wherein the first and the second stream are recorded as logically-separated files; and

making presentation of the read units of the first stream in conjunction with a third stream that is received from a device other than the recording medium.

15. The method of claim 14, wherein size of each interleaved unit of the first and the second stream is equal to or multiples of an allocation unit defined by FAT (File Allocation Table) of the recording medium.

16. A method of reproducing a multi-component data stream recorded on a recording medium, comprising:

reproducing the multi-component data stream where a first stream and a second stream interleaved on a physical recording area of the recording medium, wherein the first and the second stream are recorded as logically-separated files; and

at a jump request, moving a reproduction point on a current interleaving unit of the first stream to other target interleaving unit after reproduction of the current interleaving unit to the last.

17. The method of claim 16, wherein the reproducing step reads an interleaved unit of the second stream prior to an associated interleaved unit of the first stream.

18. The method of claim 16, wherein each of the interleaved units of the first stream is a stream section covered by a plurality of entry points, each entry point being an information unit to indicate an arbitrary interval of a data stream.

19. The method of claim 18, wherein the moving step conducts the jumping operation after reproducing a stream interval on the current interleaved unit that is indicated by an entry point having information indicative of a last interval pertaining to the current interleaved unit.

20. A recording medium having a multi-component data stream recorded thereon, comprising:

a first stream and a second stream associated with the first stream being interleaved alternately; and

a first file organized by interleaved units of the first stream and a second file organized by interleaved units of the second stream.

21. The recording medium of claim 20, further comprising a plurality of entry points, each being an information unit to indicate an arbitrary interval of the first stream.

22. The recording medium of claim 21, wherein each of the

interleaved units of the first stream is a stream section covered by at least one entry point.

23. The recording medium of claim 22, wherein all of the interleaved units of the first stream are respectively covered by same number of entry points.

24. The recording medium of claim 22, wherein a last entry point among entry points covering each interleaved unit of the first stream has information indicative of a last interval pertaining to the interleaved unit.

25. The recording medium of claim 20, wherein size of each interleaved unit of the first and the second stream is equal to or multiples of an allocation unit defined by FAT (File Allocation Table) of the recording medium.

26. The recording medium of claim 20, wherein the first stream has video data and the second stream has data of audio, subtitle, script language, or mark-up language document.

27. The recording medium of claim 20, wherein, on the interleaved stream of the first and the second stream, an interleaved unit of the second stream is adjacent to an interleaved unit of the first stream that is associated with the interleaved unit of the second stream.

28. The recording medium of claim 27, wherein the interleaved unit of the second stream is located just before the associated interleaved unit of the first stream.

29. An apparatus for recording a multi-component data stream on a recording medium, comprising:

a driver for driving an optical recording device to record data stream on the recording medium;

an encoder for encoding the data stream to be recorded; and

a controller for controlling the driver to record a first stream and a second stream as logically-separated files while making the first and the second stream to be interleaved on a physical recording area of the recording medium.

30. An apparatus for reproducing a multi-component data stream recorded on a recording medium, comprising:

a driver for driving an optical reproducing device to reproduce data stream recorded on the recording medium; and

a controller for controlling the driver to reproduce a multi-component data stream, where a first stream and a second stream interleaved on a physical recording area of the recording medium, while reading only interleaved units of the first stream and skipping the interleaved units of the second stream, wherein the first and the second stream are recorded as logically-separated files.

31. An apparatus for reproducing a multi-component data stream recorded on a recording medium, comprising:

a driver for driving an optical reproducing device to reproduce data stream recorded on the recording medium and for moving the optical reproducing device on the recording medium; and

a controller for controlling the driver to reproduce a multi-component data stream where a first stream and a second stream interleaved on a physical recording area of the recording medium, and at a jump request during the reproduction, to move a reproduction point on a current interleaving unit of the first stream to other target interleaving unit after reproduction of the current interleaving unit to the last, wherein the first and the second stream are recorded as logically-separated files.

FIG. 1

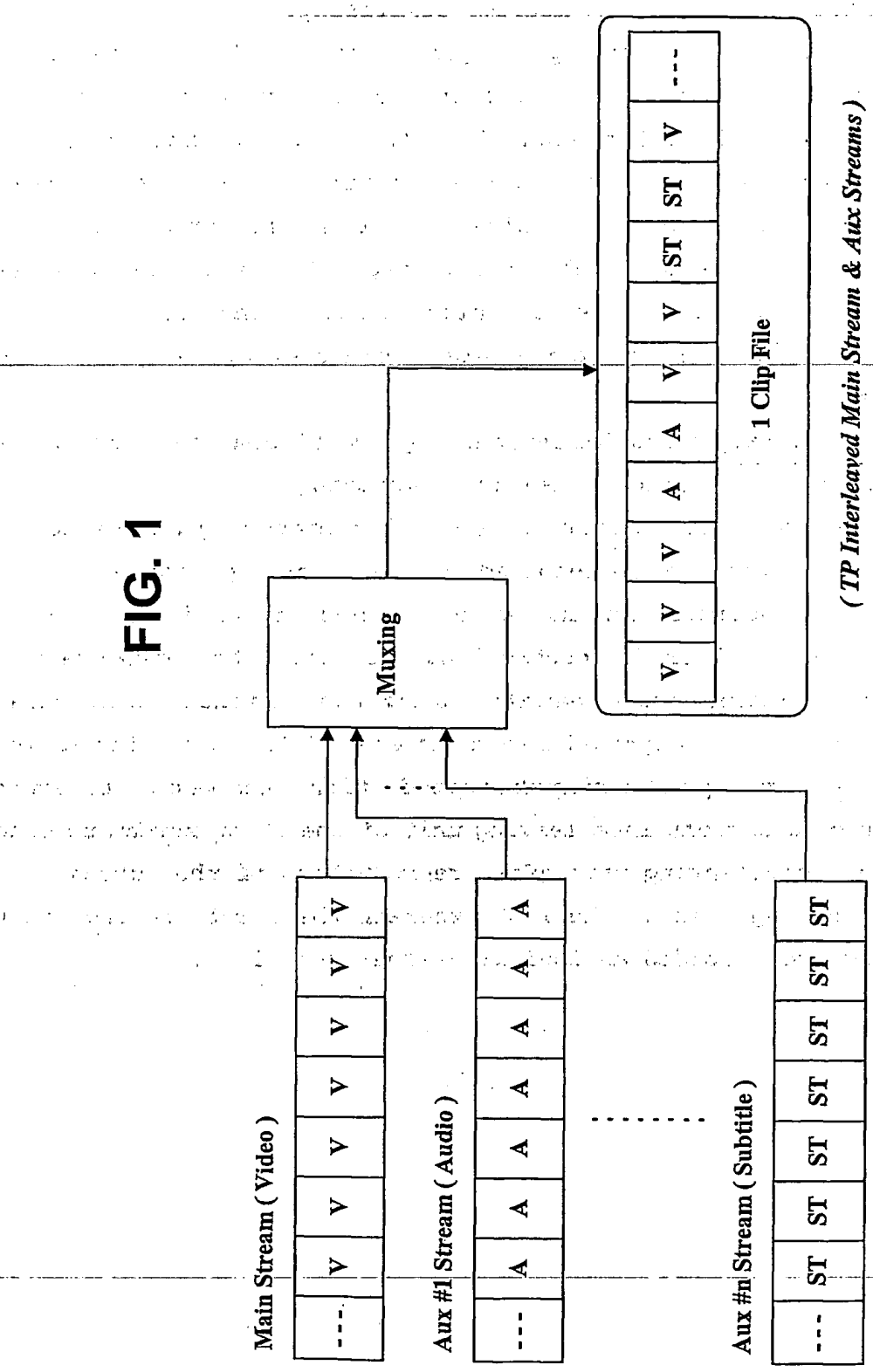


FIG. 2

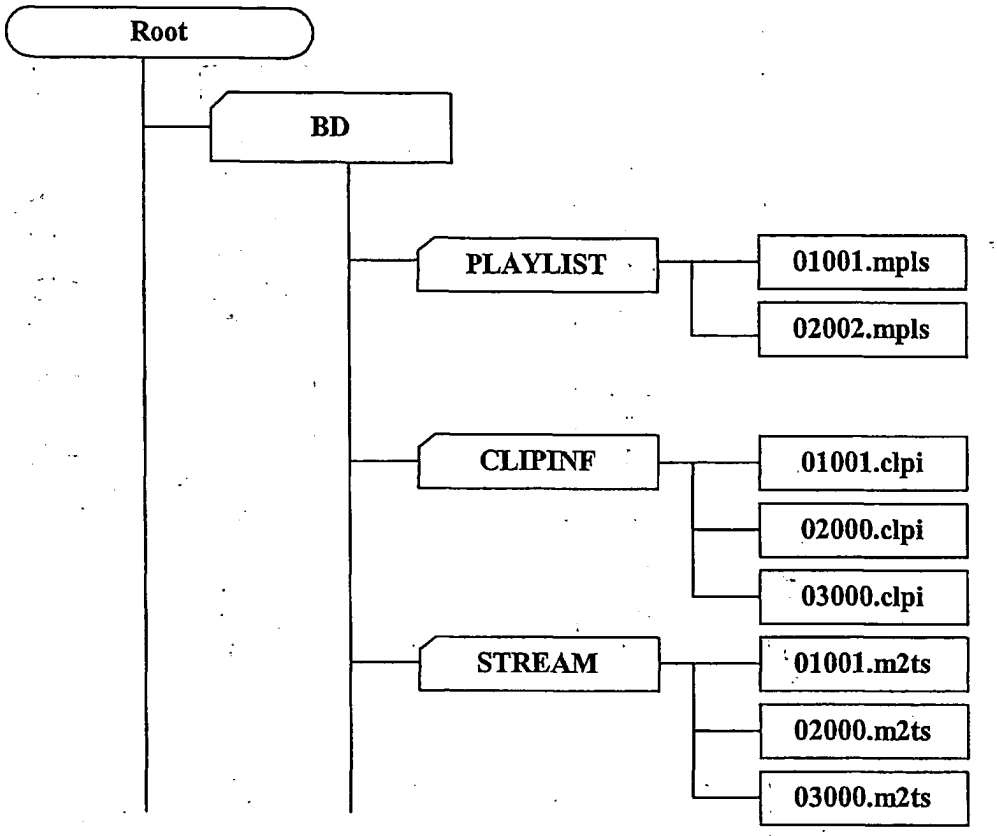

Root
BD
PLAYLIST
01001.mpls
02002.mpls
CLIPINF
01001.clpi
02000.clpi
03000.clpi
STREAM
01001.m2ts
02000.m2ts
03000.m2ts

FIG. 3

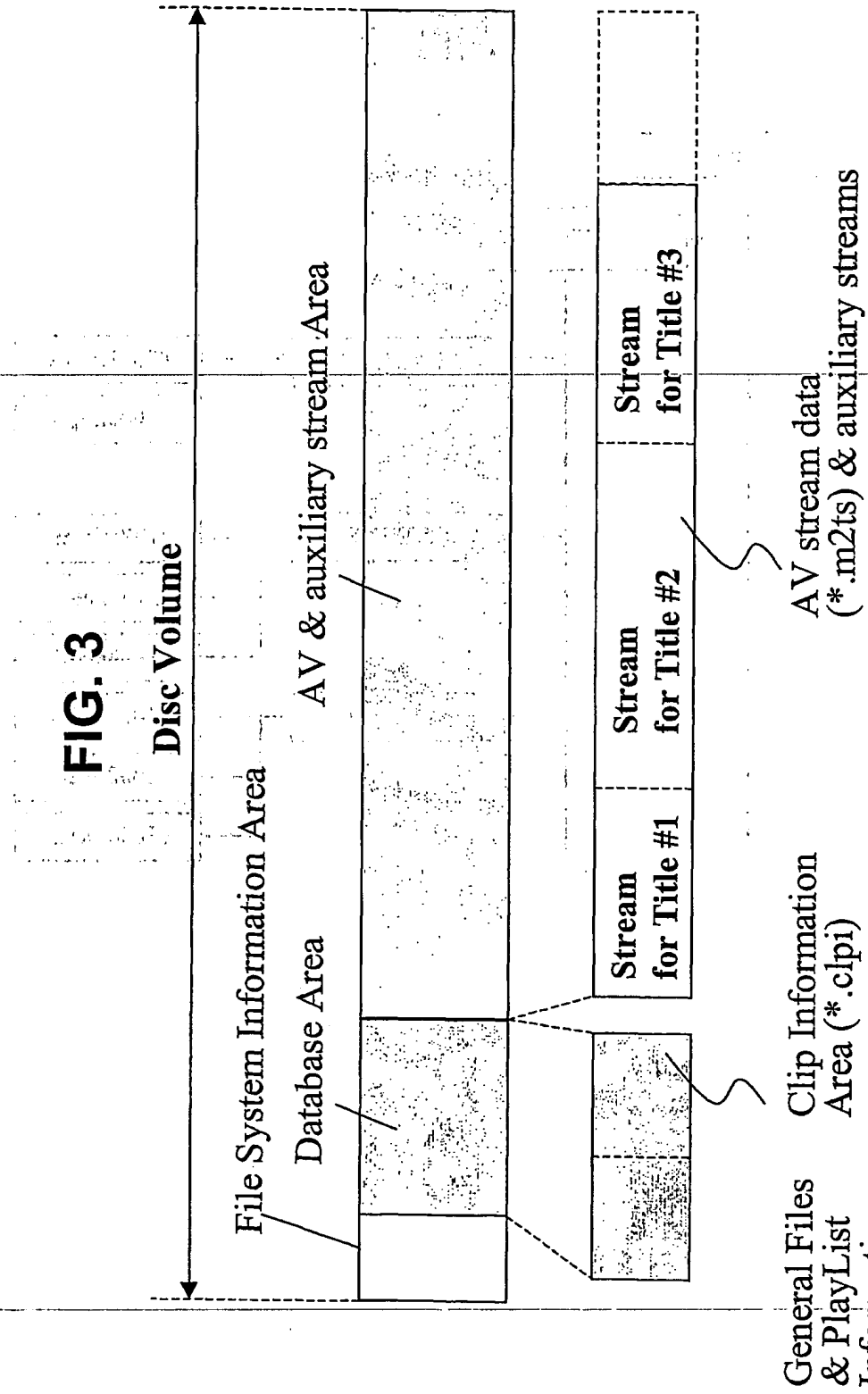


FIG. 4

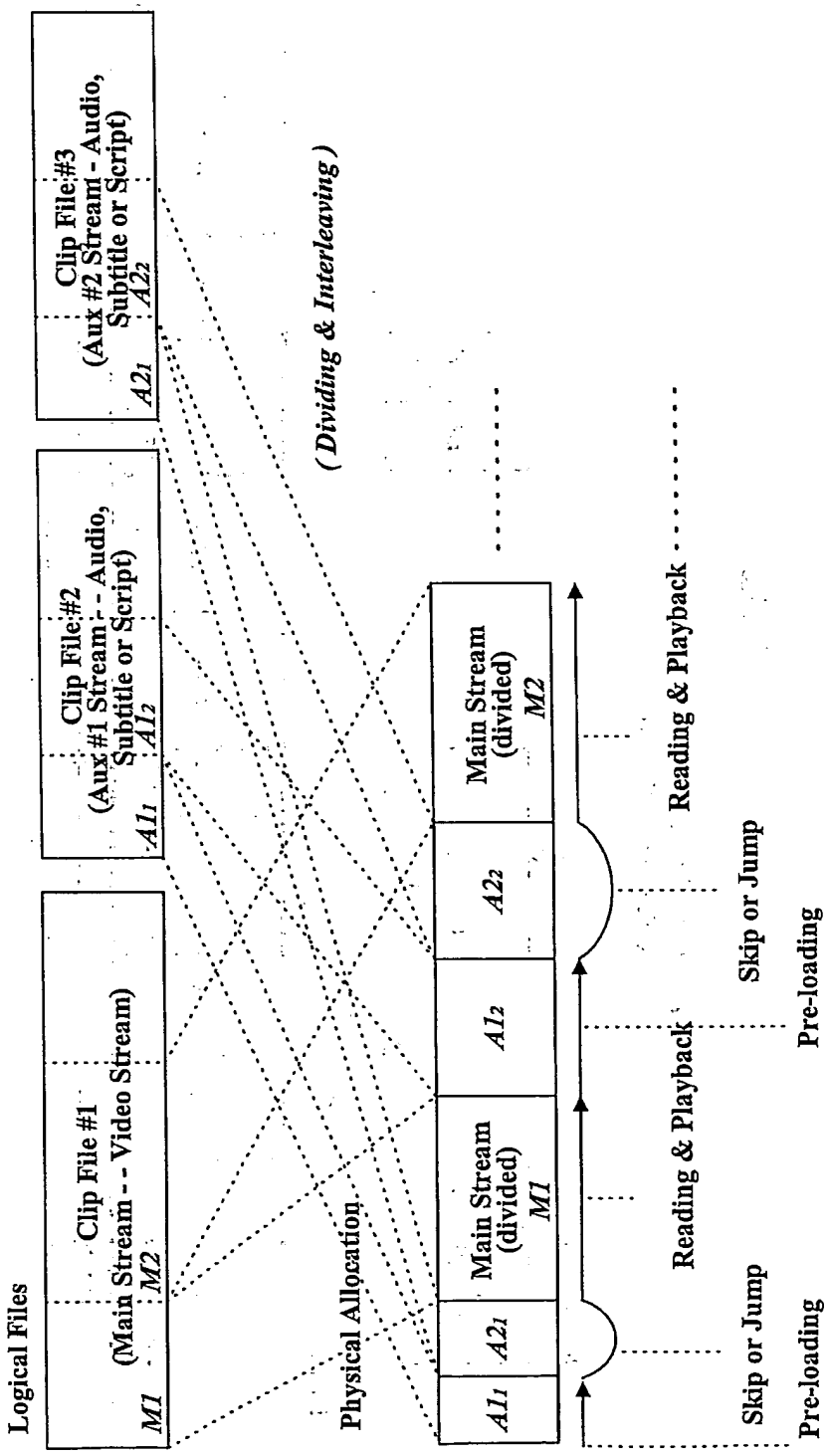

Logical Files
Clip File #1
(Main Stream - - Video Stream)
M1
M2
Clip File:#2
(Aux #1 Stream - - Audio, Subtitle or Script)
A11
A12
Clip File:#3
(Aux #2 Stream - Audio, Subtitle or Script)
A21
A22
(Dividing & Interleaving)
Physical Allocation
A11
A21
Main Stream (divided)
M1
A12
A22
Main Stream (divided)
M2
Reading & Playback
Skip or Jump
Pre-loading
Reading & Playback
Skip or Jump
Pre-loading

FIG. 5

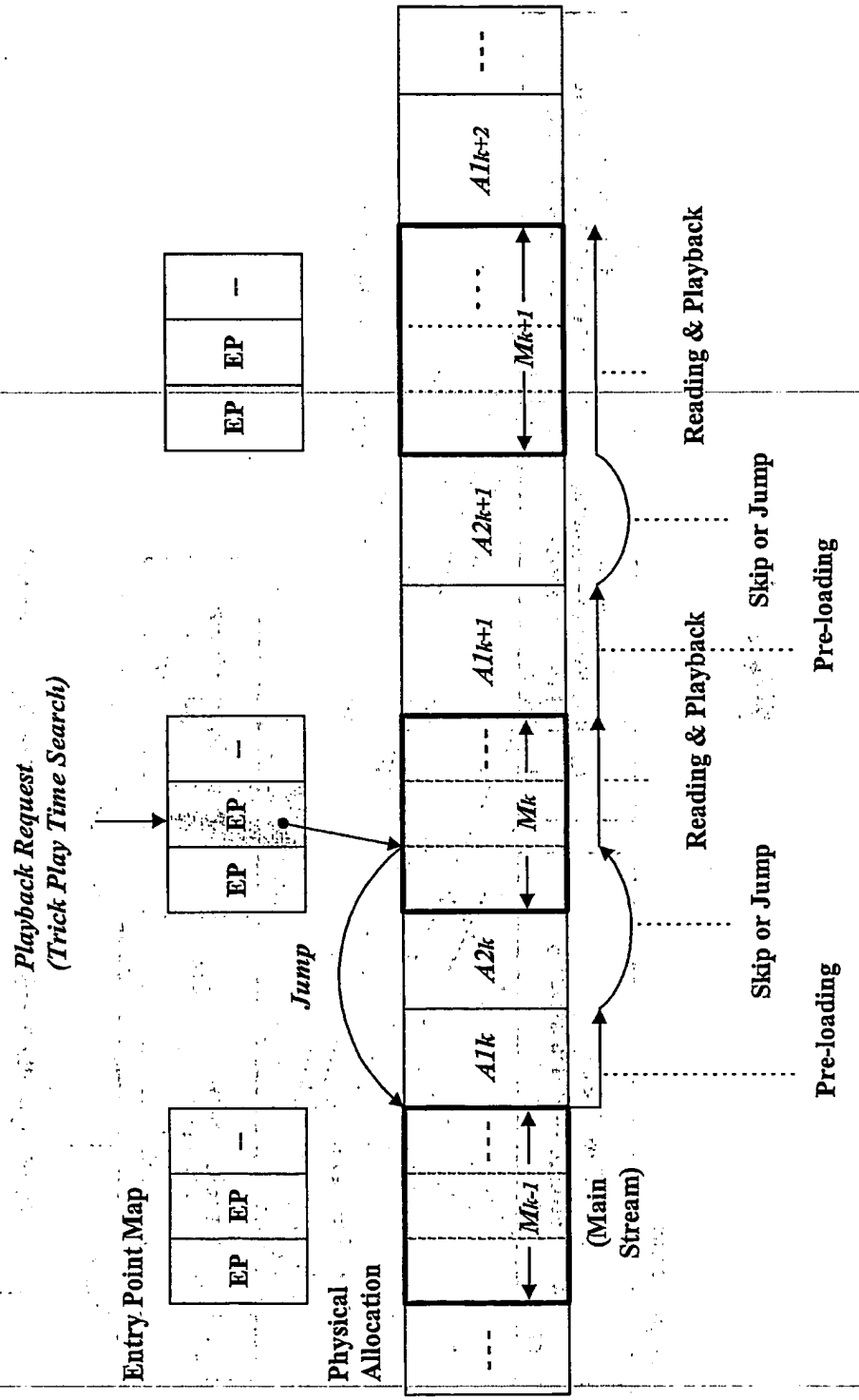
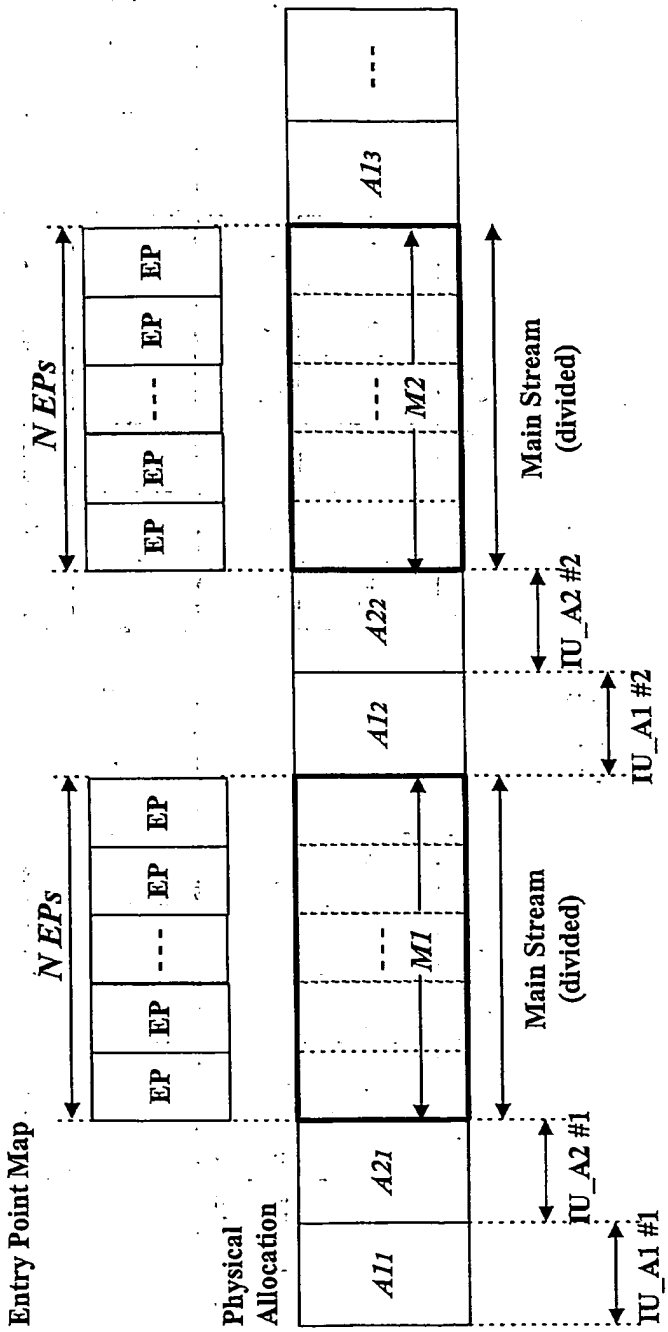


FIG. 6


Entry Point Map
Physical Allocation
N EPs
EP
EP

EP
EP
N EPs
EP
EP

EP
EP
A11
A21
A12
A22
A13
M1

M2

IU_A1 #1
IU_A2 #1
IU_A1 #2
IU_A2 #2
Main Stream (divided)
Main Stream (divided)

FIG. 7

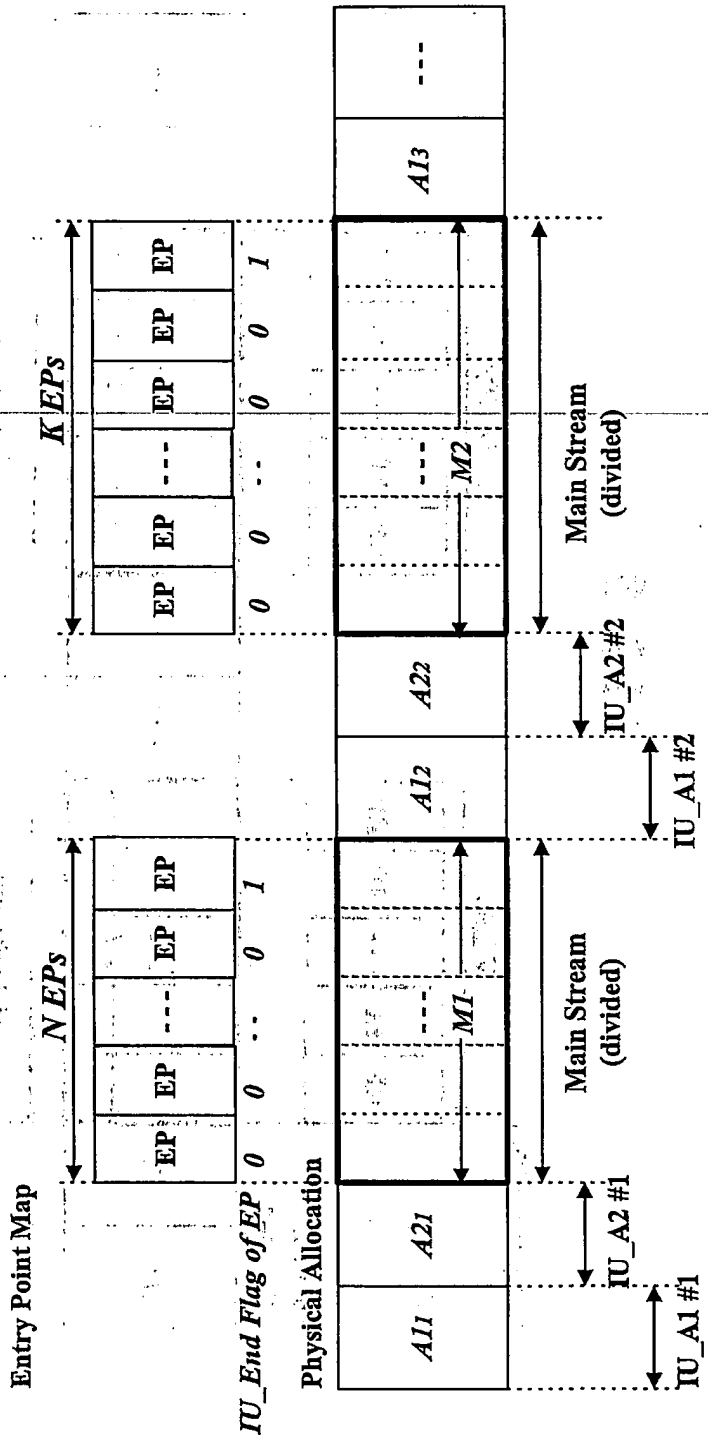


FIG. 8

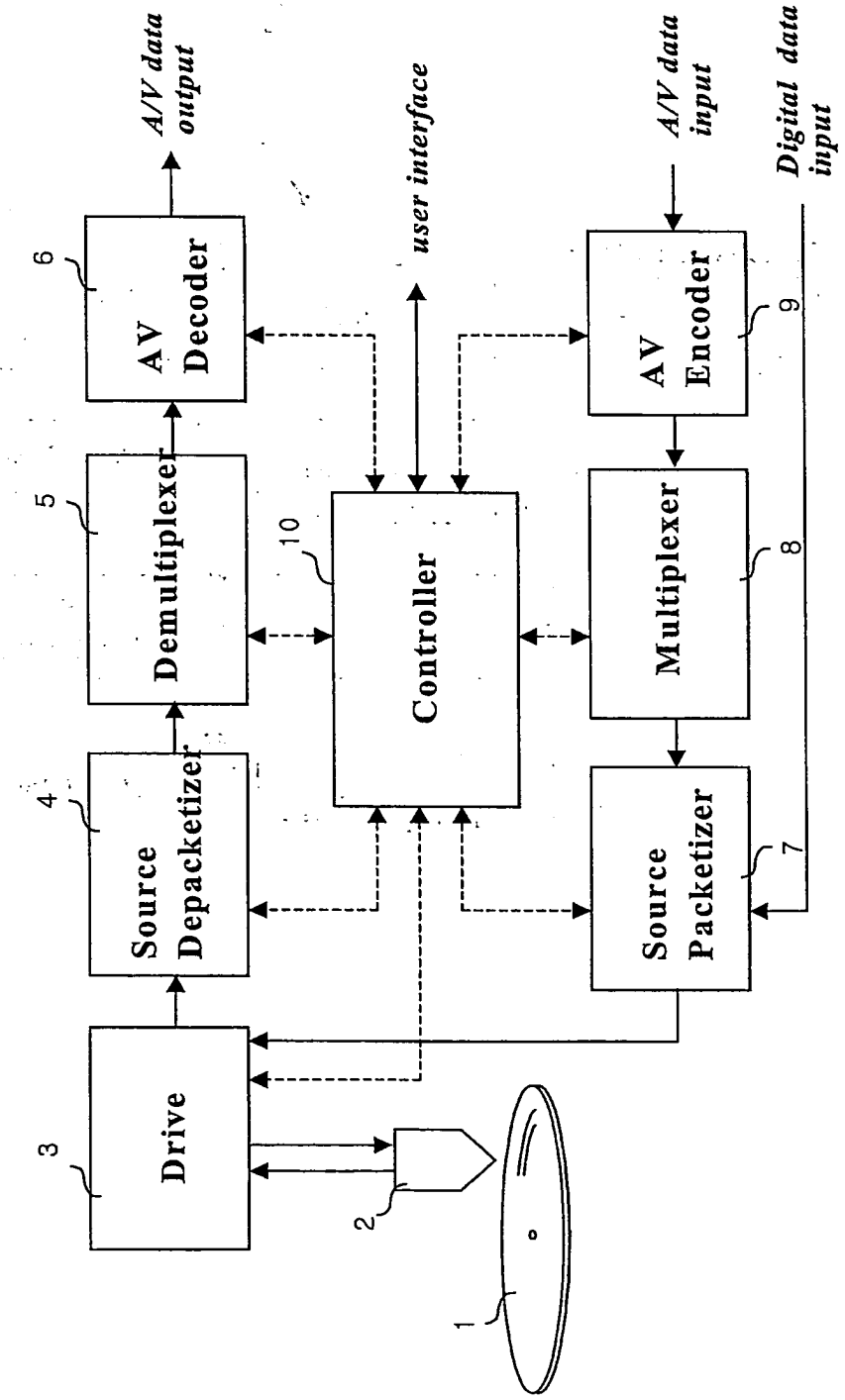
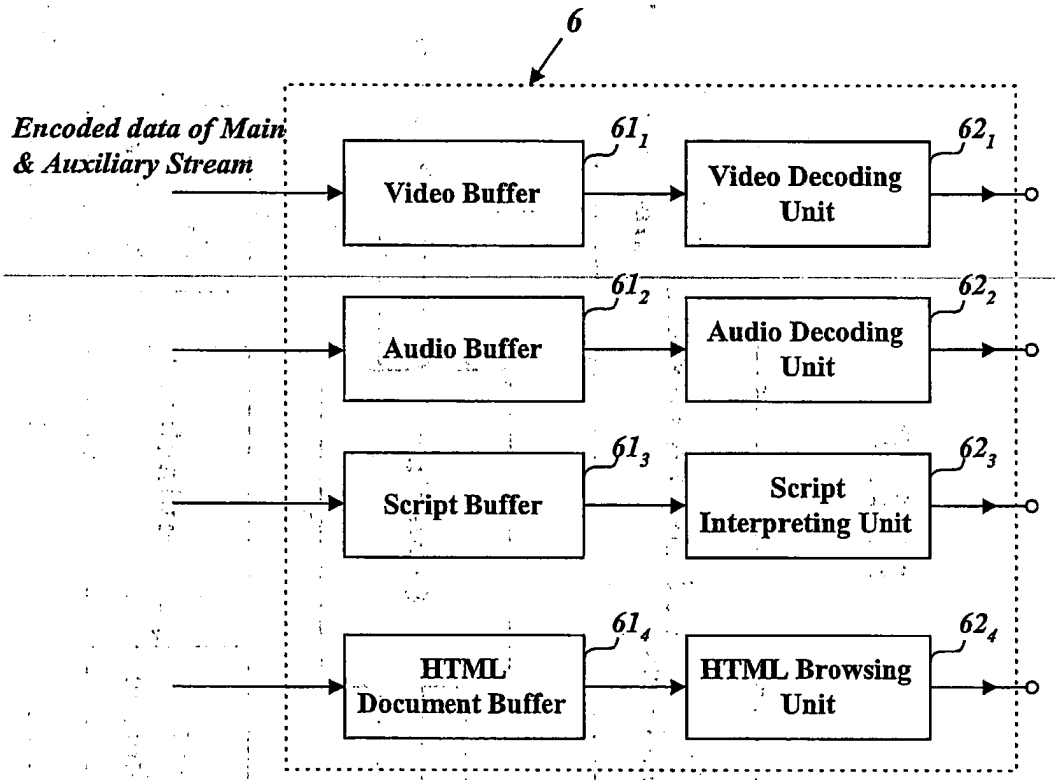

A/V data output
user interface
A/V data input
Digital data input
AV Decoder
AV Encoder
Demultiplexer
Controller
Multiplexer
Source Depacketizer
Source Packetizer
Drive
1
2
3
4
5
6
7
8
9
10

FIG. 9



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2003/002385

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 G11B 20/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G11B 20/10 G11B 20/12 G11B 7/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Patents and applications for inventions since 1975
Korean utility models and applications for utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, PAJ "multi, component, stream, record*, interleav*, entry, point"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2001-297535 A (SONY CORP.) 26 Oct. 2001 See the whole document	1, 2 13, 14, 16, 20, 29, 30, 31
Y A	JP 2002-112179 A (MATSUSHITA ELECTRIC IND CO., LTD.) 12 Apr. 2002 See the whole document	1 13, 14, 16, 20, 29, 30, 31
A	US 2002-159368 A1 (Chosaku Noda et al.) 31 Oct. 2002 See the whole document	1, 13, 14, 16, 20, 29, 30, 31
P, A	JP 2003-87744 A (MATSUSHITA ELECTRIC IND CO., LTD.) 20 Mar. 2003 See the whole document	1, 13, 14, 16, 20, 29, 30, 31

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 FEBRUARY 2004 (26.02.2004)	26 FEBRUARY 2004 (26.02.2004)

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2003/002385

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2001-297535 A	26 Oct. 2001	US 2002-172117 A1	21 Nov. 2002
JP 2002-112179 A	12 Apr. 2002	None	
US 2002-159368 A1	31 Oct. 2002	JP 2002-237140 A	23 Aug. 2002
JP 2003-087744 A	20 Mar. 2003	None	